

Here is the next batch of wiki problems from chapter 3. The points assigned to each problem are shown in the left column. Your quota of problems is still two. If you complete your quota before November 13, please give other students a chance to solve their share of problems. Between November 14 and the day of the chapter 3 test, you are free to do additional problems. These additional problems will be counted as extra credit and will be worth 2 points each.

Please note that calculators are allowed **only on questions 1 – 7**.

Mathematical Analysis

Calculators **allowed** only on questions 1 - 7.

- 3      1.      Solve  $0.5^{\frac{x}{2}} = \log_5 x^4 + 3$  for  $x < 0$  (Hint: there are two solutions). Round to the nearest hundredths
  
- 3      2.      The half-life of radioactive actinium ( $^{227}\text{Ac}$ ) is 22 years. In how many years will the radioactive actinium decay to 25% of its original amount? Round to the nearest year
  
- 3      3.      The amount  $Y$  of yeast in a culture is given by the model  $Y = \frac{663}{1 + 72e^{-0.547t}}$ ,  $0 \leq t \leq 18$ , where  $t$  represents time in hours. When will the amount of yeast reach 600? Round to four places after the decimal point.
  
- 3      4.      Carbon-14 has a half-life of 5730 years. If a fossil is found to have 60% of its original Carbon-14, how old is it? Round to the nearest tenth.
  
- 3      5.      A beaker of water has been heated to  $250^\circ\text{F}$  and then placed in a room that is  $70^\circ\text{F}$ . Find the temperature of the water after 5 minutes. Use Newton's Law of Cooling  $y = ae^{-kt} + C$  with  $k = 0.01$ . Round to the nearest hundredth.
  
- 3      6.      At Genius Academy of 500 students, one student returns from Thanksgiving vacation with a contagious flu virus. The spread of the virus is modeled by  $y = \frac{510}{1 + 509e^{-0.8t}}$ ,  $t \geq 0$ , where  $y$  is the total number infected after  $t$  days. The school will cancel classes when 45% or more students are infected. After how many days will Genius Academy cancel classes?
  
- 3      7.      How long will it take an investment of \$1000 to triple in value if it is invested at an annual rate of 12% compounded quarterly? Round to the nearest year.

Calculators **NOT** allowed. Please show your steps.

3      8.      Evaluate  $\log_{27} 81$

3      9.      Solve  $\log_7(15x - 1) + 2\log_7 3 = \log_7 54 - \log_7 x$

3      10.      Solve  $\log_x 32 = 5$

3      11.       $f(x) = 2 - \log_2(x + 4)$ . Find the following.

i) Domain

ii) **Equation** of vertical asymptote

iii) Find the x-intercept

iv) Find the y-intercept

3      12.       $f(x) = -e^x - 3$ . Identify the following.

(i) Equation of the asymptote

(ii) x-intercept

(iii) y-intercept

3      13.      Evaluate  $\log_{16} 32$

3      14.      Express  $\log_5 x - \log_5 y + 2$  as a single number or expression

3      15.      Express  $\frac{1 + \log_9 x}{2}$  as a single number or expression

- 3 16. If  $f(x) = \log_2 x$  and  $g(x) = 4^x$ , find  $f(g^{-1}(16))$
- 3 17. If  $f(x) = 3^x$  and  $g(x) = \log_9 x$ , find  $f^{-1}(g(9))$
- 3 18. Solve  $\log_6(x+1) + \log_6 x = 1$
- 3 19. Solve  $\log x + \log(6x - 5) = \log 6$
- 3 20. Find the domain and range of  $f(x) = |\ln(x^2 - 1)|$
- 3 21. Solve  $2\ln x = \ln(x + 1)$
- 3 22. Solve  $e^{2x} - 7e^x + 12 = 0$
- 3 23. Use the properties of logarithms to expand the expression as a sum, difference, and/or constant multiple of logarithms. Assume all variables are positive.
- $$\ln\left(\frac{x^3}{\sqrt{z}y^7}\right)$$
- 3 24. Condense the expression to the logarithm of a single quantity
- $$\frac{1}{7}[-3\ln(x-5) + \ln(x^2-4) - \ln x]$$
- 3 25. Find the exact value of  $\log_3 \frac{81}{8} + 3\log_3 2$
- 3 26. Solve  $\log(2^{x^2+3x}) = \log(16)$
- 3 27. Find the domain and range of  $f(x) = \ln|x^2 + 1|$

3      28. Find the exact value of  $\ln \sqrt[3]{e^2} + \log_7 \frac{49}{25} + 2 \log_7 5 - \log_3 \sqrt[4]{9}$

3      29. Solve  $2e^{2x} - e^x + 2 = 8$